DISEASE OF SUSPECTED FOODBORNE ORIGIN *(clusters only)*

Two or more cases of a confirmed or suspected illness determined to be associated with a food item is immediately reportable as a disease of suspected foodborne origin. Guidelines are listed here for Norwalk-like virus, Staphylococcus aureus*,* Clostridium perfringens *and* Bacillus cereus*. Other common foodborne agents such as* E. coli *O157:H7,* Salmonella*,* Shigella*, and* Campylobacter *are also reportable as single cases and are described separately.*

DISEASE REPORTING

In Washington

DOH receives approximately 60 to 150 reports of foodborne outbreaks per year, involving approximately 700 to 1200 ill persons. Common organisms causing foodborne outbreaks include Norwalk-like virus (NLV), *Salmonella**, *Shigella**, *E. coli**, *S. aureus*, *C. perfringens*, and *B. cereus*.

** Individual cases are also reportable; see specific disease guidelines for more information.*

Purpose of reporting and surveillance

- To identify sources of transmission (e.g., a commercial product or public water supply) and to prevent further transmission from such sources.
- When the source is a risk for only a few individuals (e.g., an animal or private meal), to inform those individuals how they can reduce their risk of exposure.
- To identify cases that may be a source of infection for others (e.g., a food handler), and prevent further disease transmission.

Reporting requirements

- Health care providers: **immediately notifiable to Local Health Jurisdiction**
- Hospitals: **immediately notifiable to Local Health Jurisdiction**
- Laboratories: see disease-specific requirements
- Local health jurisdictions: **suspected or confirmed outbreaks are immediately notifiable to DOH Communicable Disease Epidemiology: 1-877-539-4344**

CASE DEFINITION FOR SURVEILLANCE

Outbreak Definition

- Confirmed: laboratory evidence of a specific agent.
- Probable: in the absence of laboratory evidence, if 2 or 3 of the following criteria are met, the cluster is reportable as a probable outbreak:
    - High risk food identified as source of illness
    - Risk factors or errors identified in food preparation
    - Clinical syndrome compatible with defined etiologic agents associated with foodborne illness.

Outbreak report forms

DOH forms are available for use as both investigational and reporting instruments. The DOH Foodborne Outbreak Reporting Form, Part 1, allows for collection of epidemiologic data. Part 2, Field Investigation, can be used to record food preparation and handling data. The CDC "Fork and Spoon" form should be submitted with supporting documentation. Copies of all foodborne outbreak reporting forms can be found at: www.doh.wa.gov/ehp/sf/foodpubs.htm.

NORWALK-LIKE VIRUSES (NLVs)

(Norwalk agent disease, Norwalk-like disease, Viral gastroenteritis in adults, Epidemic viral gastroenteritis, Acute infectious nonbacterial gastroenteritis, Viral diarrhea, Epidemic diarrhea and vomiting, Winter vomiting disease, Epidemic nausea and vomiting)

A. DESCRIPTION

1. Identification

Usually a self-limited, mild to moderate disease that often occurs in outbreaks, with clinical symptoms of nausea, vomiting, diarrhea, abdominal pain, myalgia, headache, malaise, low grade fever or a combination of these symptoms. NLV-caused gastroenteritis has an average incubation of 12-48 hours and lasts 12-60 hours.

The virus may be identified in stool by direct or immune EM or, for the Norwalk virus, by RIA or by reverse transcription polymerase chain reaction (RT-PCR). Serologic evidence of infection may be demonstrated by IEM or, for the Norwalk virus, by RIA. Diagnosis requires collection of a large volume of stool, with aliquots stored at 4°C (39°F) for EM, and at -20°C (-4°F) for antigen assays. Acute and convalescent sera (3-4-week interval) are essential to link particles observed by EM with disease etiology. RT-PCR seems to be more sensitive than IEM and can be used to examine links among widely scattered clusters of disease.

2. Infectious Agents

Norwalk-like viruses are small, 27-to 32-nm, structured RNA viruses classified as caliciviruses; they have been implicated as the most common etiologic agent of the nonbacterial gastroenteritis outbreaks. Several morphologically similar but antigenically distinct viruses have been associated with gastroenteritis outbreaks; these include Hawaii, Taunton, Ditchling or W, Cockle, Parramatta, Oklahoma and Snow Mountain agents.

3. Worldwide Occurrence

Worldwide and common; most often in outbreaks but also sporadically; all age groups are affected. Outbreaks in the U.S. have been associated with consumption of salads, fruits, and other ready-to-eat foods handled by an ill food handler, raw shellfish, and via person-to-person spread. In one study in the US, antibodies to Norwalk agent were acquired slowly; by the fifth decade of life, more than 60% of the population had antibodies. In most developing countries studied, antibodies are acquired much earlier. Seroresponse to Norwalk virus was detected in infants and young children in Bangladesh and Finland.

4. Reservoir

Humans are the only known reservoir.

5. Mode of Transmission

Probably by the fecal-oral route, although airborne and fomite transmission might facilitate spread during outbreaks. Several recent outbreaks have strongly suggested primary community foodborne, waterborne and shellfish transmission, with secondary transmission to family members.

6. Incubation period

Usually 24-48 hours; in volunteer studies with Norwalk agent, the range was 10-50 hours.

7. Period of communicability

Previously researchers believed a person remained contagious 48-72 hours after Norwalk diarrhea stops. However, data from recent studies of volunteers using more sensitive diagnostic assays suggest that viral shedding in stool begins 15 hours after virus administration and peaks 25-72 hours after virus administration. Unexpectedly, viral antigen could be detected by ELISA in stool specimens collected 7 days after inoculation in both symptomatic and asymptomatic persons.

8. Susceptibility and resistance

Susceptibility is widespread. Short-term immunity lasting up to 14 weeks has been demonstrated in volunteers after induced Norwalk illness, but long-term immunity was variable; some individuals became ill on rechallenge 27-42 months later. Levels of preexisting serum antibody to Norwalk virus did not correlate with susceptibility or resistance.

B. METHODS OF CONTROL

1. Preventive measures:

Use hygienic measures applicable to diseases transmitted via fecal-oral route (see TYPHOID FEVER, B1). Cooking shellfish and surveillance of shellfish breeding waters can prevent infection from that source. Eliminating bare-hand contact of ready-to-eat foods or foods handled after cooking will reduce the spread of NLV by infected food handlers. Persons ill with vomiting or diarrhea should not prepare food for others.

2. Control of patient, contacts and the immediate environment:

a. Report outbreaks to local health authority.
b. Isolation: Enteric precautions.
c. Concurrent disinfection: None.
d. Quarantine: None.
e. Immunization of contacts: None.
f. Investigation of contacts and source of infection: Search for means of spread of infection in outbreak situations.
g. Specific treatment: Fluid and electrolyte replacement in severe cases (see CHOLERA, B2g).

3. Epidemic measures

Search for vehicles of transmission and source; determine course of outbreak to define the epidemiology.

4. International measures

None.

STAPHYLOCOCCAL FOOD INTOXICATION

A. DESCRIPTION

1. Identification

An intoxication (not an infection) of abrupt and sometimes violent onset, with severe nausea, cramps, vomiting and prostration, often accompanied by diarrhea, and sometimes with subnormal temperature and lowered blood pressure. Deaths are rare; duration of illness is commonly not more than a day or two, but the intensity of symptoms may require hospitalization and may result in surgical exploration in sporadic cases. Diagnosis is easier when a group of cases is seen with the characteristic acute, predominantly upper GI symptoms and the short interval between eating a common food item and the onset of symptoms.

Differential diagnosis includes other recognized forms of food poisoning as well as chemical poisons.

In the outbreak setting, recovery of large numbers of staphylococci (10^5 organisms or more per gram of food) on routine culture media or detection of enterotoxin from an epidemiologically implicated food item confirms the diagnosis. Absence of staphylococci on culture of a heated food does not rule out the diagnosis; a Gram stain of the food may disclose the organisms that have been heat killed. It may be possible to identify enterotoxin or thermonuclease in the food in the absence of viable organisms. Isolation of organisms of the same phage type from stools or vomitus of two or more ill persons also confirms the diagnosis. Recovery of large numbers of enterotoxin producing staphylococci from stool or vomitus from a single person supports the diagnosis. Phage typing and enterotoxin tests may help epidemiologic investigations but are not routinely available or indicated.

2. Toxic Agent

Several enterotoxins of *Staphylococcus aureus*, stable at boiling temperature. Staphylococci multiply in food and produce the toxins.

3. Worldwide Occurrence

Widespread and relatively frequent; one of the principal acute food intoxications in the US. About 25% of people are carriers of this pathogen.

4. Reservoir

Humans in most instances; occasionally cows with infected udders, as well as dogs and fowl.

5. Mode of Transmission

By ingestion of a food product containing staphylococcal enterotoxin. Foods involved are particularly those that come in contact with food handlers' hands, either without subsequent cooking or with inadequate heating or refrigeration, such as pastries, custards, salad dressings, sandwiches, sliced meat and meat products. Toxin has also developed in inadequately cured ham and salami, and in nonprocessed or inadequately processed cheese. When these foods remain at room temperature for several hours before being eaten, toxin producing staphylococci multiply and elaborate the heat stable toxin.

The organisms may be of human origin from purulent discharges of an infected finger or eye, abscesses, acneiform facial eruptions, nasopharyngeal secretions, or apparently normal skin; or of bovine origin, such as contaminated milk or milk products, especially cheese.

6. Incubation period

Interval between eating food and onset of symptoms is 30 minutes to 8 hours, usually 2-4 hours.

7. Period of communicability

Not applicable.

8. Susceptibility and resistance

Most people are susceptible.

B. METHODS OF CONTROL

1. Preventive measures:

a. Educate food handlers and the public about: (a) strict food hygiene, sanitation and cleanliness of kitchens, proper temperature control, handwashing, cleaning of fingernails; and (b) the danger of working with exposed skin, nose or eye infections and uncovered wounds.
b. Reduce food handling time (initial preparation to service) to an absolute minimum, with no more than 4 hours at ambient temperature. Keep perishable foods hot (greater than 60ºC/140ºF) or cold (below 10ºC /50ºF; best is less than 4ºC/39ºF) in shallow containers and covered, if they are to be stored for more than 2 hours.
c. Temporarily exclude people with boils, abscesses and other purulent lesions of hands, face or nose from food handling.

2. Control of patient, contacts and the immediate environment:

a. Report outbreaks of suspected or confirmed cases to local health authority.
b. Isolation: Not pertinent.
c. Concurrent disinfection: Not pertinent.
d. Quarantine: Not pertinent.
e. Immunization of contacts: Not pertinent.
f. Investigation of contacts and source of infection: Control is of outbreaks; single cases are rarely identified.
g. Specific treatment: Fluid replacement when indicated.

3. Epidemic measures

a. By quick review of reported cases, determine time and place of exposure and the population at risk; obtain a complete listing of the foods served and embargo, under refrigeration, all foods still available. The prominent clinical features, coupled with an estimate of the incubation period, provide useful leads to the most probable etiologic agent. Collect specimens of feces and vomitus for laboratory examination; alert the laboratory to suspected etiologic agents. Interview a random sample of those exposed. Compare the attack rates for specific food items eaten and not eaten; the implicated food item(s) will usually have the greatest difference in attack rates. Most of the sick will have eaten the contaminated food.
b. Inquire about the origin of the incriminated food and the manner of its preparation and storage before serving. Look for possible sources of contamination and periods of inadequate refrigeration and heating that would permit growth of staphylococci. Submit any leftover suspected foods promptly for laboratory examination; failure to isolate staphylococci does not exclude the presence of the heat resistant enterotoxin if the food had been heated.
c. Search for food handlers with skin infections, particularly of the hands. Culture all purulent lesions and collect nasal swabs from all foodhandlers. Antibiograms and/or phage typing of representative strains of enterotoxin producing staphylococci isolated from foods and food handlers and from vomitus or feces of patients may be helpful.

4. International measures

WHO Collaborating Centres.

CLOSTRIDIUM PERFRINGENS FOOD INTOXICATION

A. DESCRIPTION

1. Identification

An intestinal disorder characterized by sudden onset of colic followed by diarrhea; nausea is common, but vomiting and fever are usually absent. Generally a mild disease of short duration, 1 day or less, and rarely fatal in healthy people. Outbreaks of severe disease with high case-fatality rates associated with a necrotizing enteritis have been documented in postwar Germany and in Papua New Guinea.

In the outbreak setting, diagnosis is confirmed by demonstration of *Clostridium perfringens* in semiquantitative anaerobic cultures of food (10^5/g or greater) or patients' stool (10^6/g or greater) in addition to clinical and epidemiologic evidence. Detection of enterotoxin in the stool of ill persons also confirms the diagnosis. When serotyping can be performed, the same serotype is usually demonstrated in different specimens; serotyping is done routinely only in Japan and the UK.

2. Infectious Agent

Type A strains of *C. perfringens* (*C. welchii*) cause typical food poisoning outbreaks (they also cause gas gangrene); type C strains cause necrotizing enteritis. Disease is produced by toxins elaborated by the organisms.

3. Worldwide Occurrence

Widespread and relatively frequent in countries with cooking practices that favor multiplication of clostridia to high levels.

4. Reservoir

Soil; also the GI tract of healthy people and animals (cattle, pigs, poultry and fish).

5. Mode of Transmission

Ingestion of food that was contaminated by soil or feces and then held under conditions that permit multiplication of the organism. Almost all outbreaks are associated with inadequately heated or reheated meats, usually stews, meat pies, and gravies made of beef, turkey or chicken. Spores survive normal cooking temperatures, germinate and multiply during slow cooling, storage at ambient temperature, and/or inadequate rewarming. Outbreaks are usually traced to food catering firms, restaurants, cafeterias and schools that have inadequate cooling and refrigeration facilities for large-scale service. Heavy bacterial contamination (more than 10^5 organisms per gram of food) is usually required for clinical disease.

6. Incubation period

From 6 to 24 hours, usually 10-12 hours.

7. Period of communicability

Not applicable.

8. Susceptibility and resistance

Most people are probably susceptible. In volunteer studies, no resistance was observed after repeated exposures.

B. METHODS OF CONTROL

1. Preventive measures:

a. Educate food handlers about the risks inherent in large scale cooking, especially of meat dishes. Where possible, encourage serving hot dishes while still hot from initial cooking.
b. Serve meat dishes hot, as soon as they are cooked, or cool them rapidly in a properly designed chiller and refrigerate until serving time; reheating, if necessary, should be thorough (internal temperature of at least 70ºC/158ºF, preferably 75ºC/167ºF or higher) and rapid. Do not partially cook meat and poultry one day and reheat the next, unless it can be stored at a safe temperature. Large cuts of meat should be thoroughly cooked; for more rapid cooling of cooked foods, divide stews and similar dishes prepared in bulk into many shallow containers and place in a rapid chiller.

2. Control of patient, contacts and the immediate environment:

See STAPHYLOCOCCAL FOOD INTOXICATION.

3. Epidemic measures

See STAPHYLOCOCCAL FOOD INTOXICATION.

4. International measures

See STAPHYLOCOCCAL FOOD INTOXICATION.

BACILLUS CEREUS FOOD INTOXICATION

A. DESCRIPTION

1. Identification

An intoxication characterized in some cases by sudden onset of nausea and vomiting, and in others by colic and diarrhea. Illness generally persists no longer than 24 hours and is rarely fatal.

In the outbreak setting, diagnosis is confirmed by performing quantitative cultures with selective media to estimate the number of organisms present in the suspected food (generally more than 10^5 organisms per gram of the incriminated food are required). Diagnosis is also confirmed by isolation of organisms from the stool of two or more ill persons and not from stools of controls. Enterotoxin testing is valuable but may not be widely available.

2. Toxic Agent

Bacillus cereus, an aerobic spore former. Two enterotoxins have been identified, one (heat stable) causing vomiting, and one (heat labile) causing diarrhea.

3. Worldwide Occurrence

A well recognized cause of foodborne disease in the world; rarely reported in the US.

4. Reservoir

A ubiquitous organism in soil and the environment commonly found at low levels in raw, dried and processed foods.

5. Mode of Transmission

Ingestion of food that has been kept at ambient temperatures after cooking, permitting multiplication of the organisms. Outbreaks associated with vomiting have been most commonly associated with cooked rice that had subsequently been held at ambient room temperatures before reheating. Various mishandled foods have been implicated in outbreaks associated with diarrhea.

6. Incubation period

From 1 to 6 hours in cases where vomiting is the predominant symptom; from 6 to 24 hours where diarrhea is predominant.

7. Period of communicability

Not communicable from person to person.

8. Susceptibility and resistance

Unknown.

B. METHODS OF CONTROL

1. Preventive measures:

Foods should not remain at ambient temperature after cooking, since the ubiquitous *B. cereus* spores can survive boiling, germinate, and multiply rapidly at room temperature. Refrigerate leftover food promptly; reheat thoroughly and rapidly to avoid multiplication of microorganisms. Heating will not destroy the heat-stable enterotoxin.

2. Control of patient, contacts and the immediate environment:

See STAPHYLOCOCCAL FOOD INTOXICATION.

3. Epidemic measures

See STAPHYLOCOCCAL FOOD INTOXICATION.

4. International measures

None.